

FIG. 1

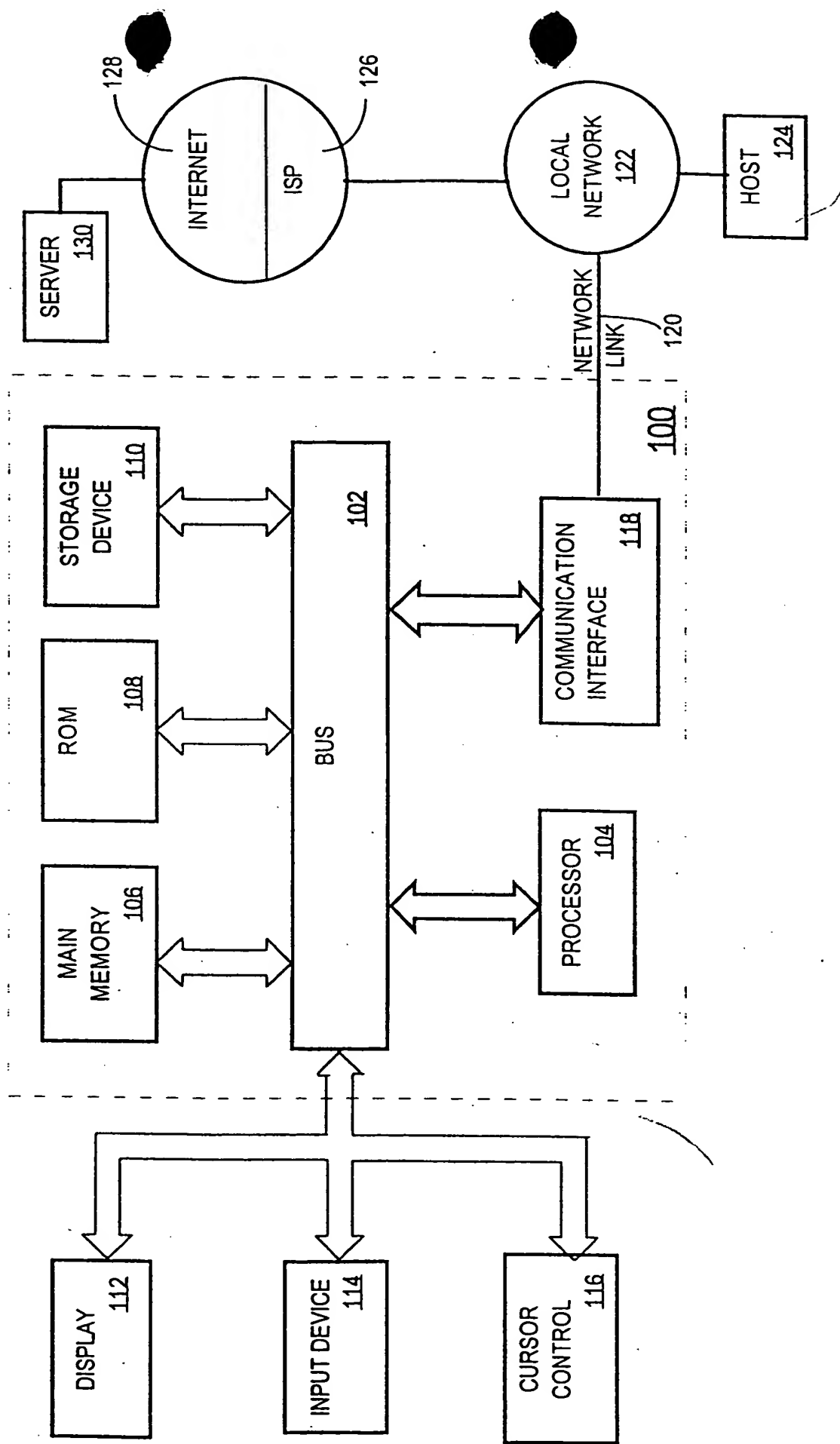


FIG. 2

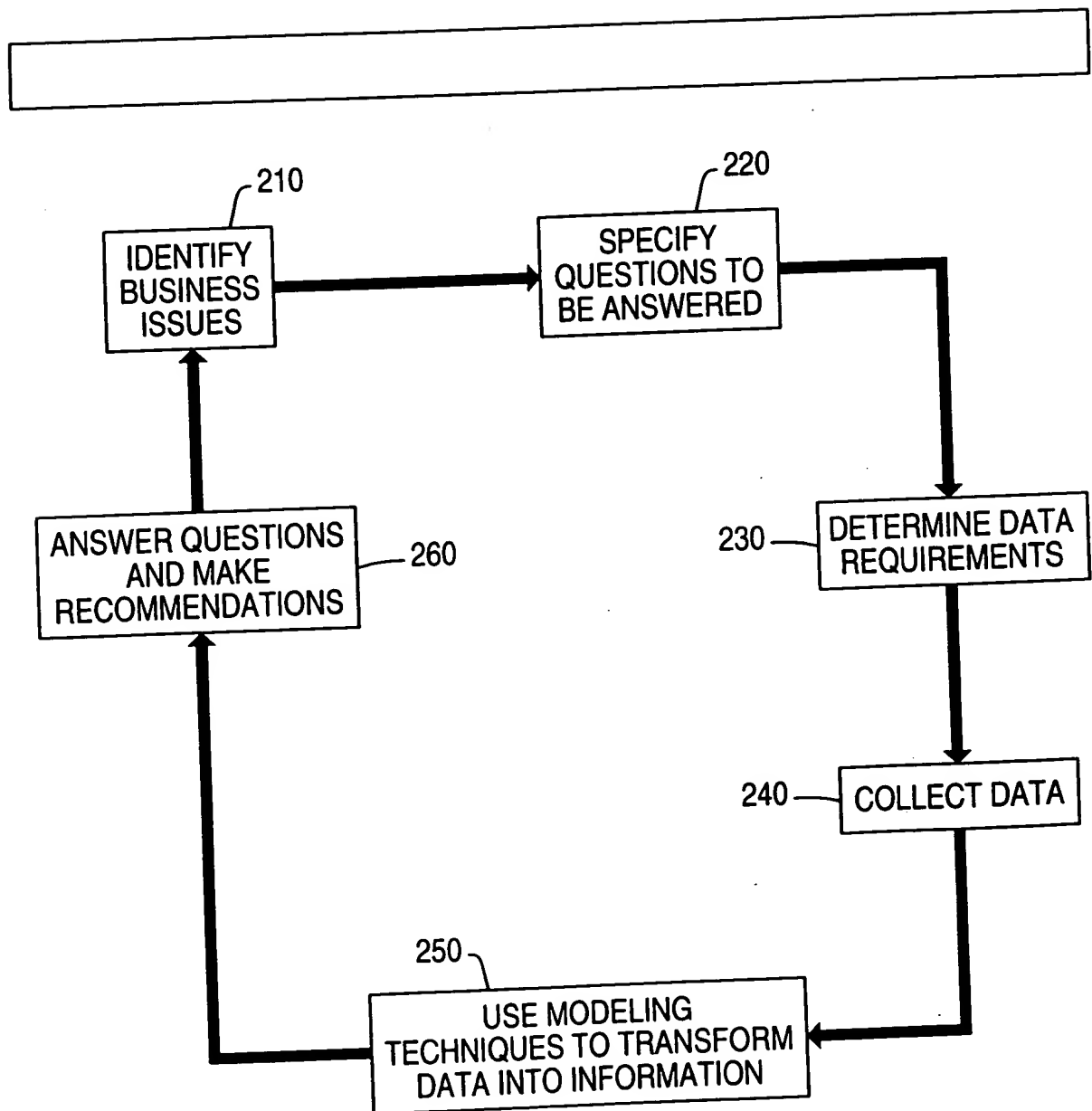
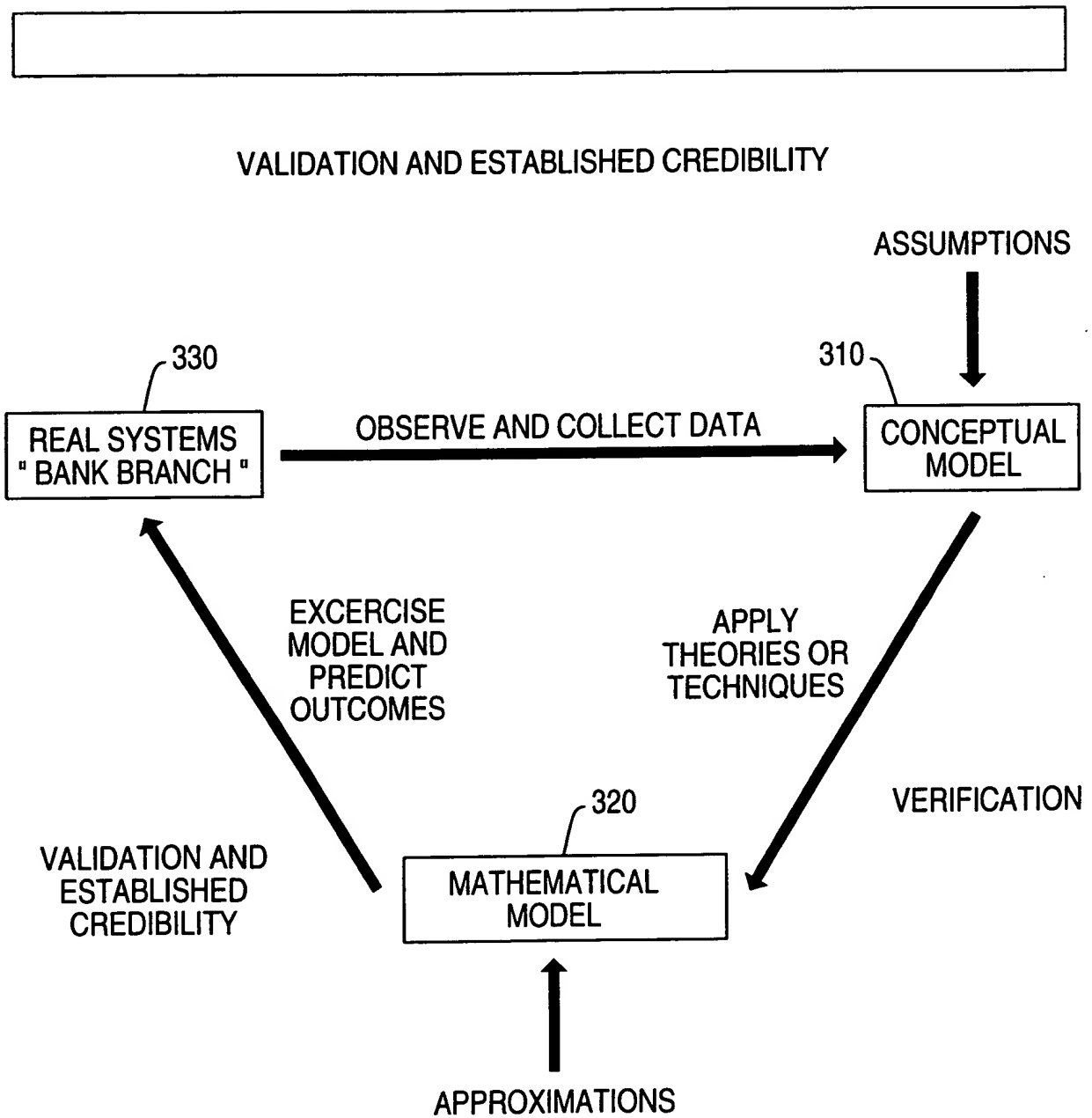


FIG. 3



Lane And Front-End Effectiveness Model

Developed by



Human Factors Engineering

Input Module 410

Run Simulation 420

Output Module 430

Quit Application 440

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FIG. 4

Input Module

Models

Model Name

Front End Model 1 (Store Checkout)

512

Lane Model 1 (Front Facing)

514

Lane Model 2 (Netson)

516

Lane Model 3 (Fast Track)

518

Scenarios

Scenario Name

Default

532

Default Case for FEModel 1

Create Parameter File

Model Name
Front End Model 1 (Store Checkout)

Please Select the Scenario You Want to Clone

Scenario Name	Scenario Description
(X) Default	Default Case for FEModel 1

Please Type Scenario Name and Description in the Text Boxes Below

Scenario Name: Test 1 Scenario Description: Add 4 checkstands: 1 Express & 3 Regular

FIG. 6

Input Module

Models

- 722 Front End Model 1 (Store Checkout)
- 724 Lane Model 1 (Front Facing)
- 726 Lane Model 2 (Nelson)
- 728 Lane Model 3 (Fast Track)

Scenarios

- 732 Default
- 730 Test 1

Model Name
Front End Model 1 (Store Checkout)
Lane Model 1 (Front Facing)
Lane Model 2 (Nelson)
Lane Model 3 (Fast Track)

Scenario Name	Scenario Description
Default	Default Case for FEModel 1
Test 1	Add 4 Checkstands: 1 Express & 3 Regular

☐ Animation

FIG. 7

Edit Parameter File

Model Name: Front End Model 1 (Store Checkout) Scenario Name: Test 1

Parameter Categories

Transaction
Randomization
822

Transaction
Finalization
827

Transaction
Bagging
826

Transaction
Intervention
828

Configuration
824

Customer
Demand
821

Schedules
825

Model
Parameters
836

Lane Type	Parameter <i>850</i>	Value <i>855</i>	Range <i>860</i>	Description <i>865</i>
<input type="radio"/> F	Start time of the simulation scenario (hours)	6	0 to 24 (hours)	Start time of the simulation scenario in hour from midnight
<input type="radio"/> E	End time of the simulation scenario (hours)	23	0 to 24 (hours)	End time of the simulation scenario in hours from midnight. End time must be greater than Start time
<input type="radio"/> R	Number of Fast-Track lanes	1	0 to 47	Number of Fast-Track lanes at the front-end. The total number of all lanes cannot exceed 48
<input type="radio"/> All	Number of Express lanes	3	0 to 47	Number of Express lanes at the front-end. The total number of all lanes cannot exceed 48
	Number of Regular lanes	13	1 to 48	Number of Regular lanes at the front-end. The total number of all lanes cannot exceed 48

Return to Input Form

FIG. 8

Edit Parameter File

Model Name: Lane Model 2 (Netson) Scenario Name: Default

Parameter Categories

Transaction
Randomization
922

Transaction
Finalization
927

Transaction
Finalization
926

Bagging
928

Configuration
924

Customer
Demand
921

Model
Parameters
925

Intervention
923

Lane #	Parameter <i>950</i>	Value <i>955</i>	Range <i>960</i>	Description <i>965</i>
<input type="radio"/> 1	Time length of scenario	60	0.0 to 1440.0 (minutes)	Length of the simulation scenario in minutes
<input type="radio"/> 2	Number of baggers	1	0, 1, or 2	Number of baggers; options are 0 baggers, 1 bagger for both lanes, or 2 baggers - one for each lane
<input type="radio"/> All	Maximum number of items on front belt	20	1 to 200	Maximum number of items on front belt
	Maximum number of items in bagging area	20	1 to 200	Maximum number of items on back belt and bagging area
	Probability of basket icon	0.5	0.0 to 1.0	Probability a customer uses a basket (vs. cart) when their

Return to Input Form

FIG. 9

Arrival Rate Schedule

Time Interval	Number of Arrivals
4:45 AM - 5:00 AM	0
5:01 AM - 5:15 AM	0
5:16 AM - 5:30 AM	0
5:31 AM - 5:45 AM	0
5:46 AM - 6:00 AM	0
6:01 AM - 6:15 AM	4
6:16 AM - 6:30 AM	12
6:31 AM - 6:45 AM	8
6:46 AM - 7:00 AM	20
7:01 AM - 7:15 AM	28
7:16 AM - 7:30 AM	20
7:31 AM - 7:45 AM	24
7:46 AM - 8:00 AM	28

Enter the number of arrivals per hour in each 15-minute time interval

1000 →

1060

1015

1010

Print Schedule 1060

Return to Edit Form 1065

FIG. 10

Average Basket Sizes

Time Interval	Avg Basket Size
12:01 AM - 12:15 AM	0
12:16 AM - 12:30 AM	0
12:31 AM - 12:45 AM	0
12:46 AM - 1:00 AM	0
1:01 AM - 1:15 AM	0
1:16 AM - 1:30 AM	0
1:31 AM - 1:45 AM	0
1:46 AM - 2:00 AM	0
2:01 AM - 2:15 AM	0
2:16 AM - 2:30 AM	0
2:31 AM - 2:45 AM	0
2:46 AM - 3:00 AM	0
3:01 AM - 3:15 AM	0

1100 →

1150

1115

1110

Print Basket Sizes 1160

Return to Edit Form 1165

FIG. 11

Schedules

Super/Helper 1220

1225 Bagger

1230 All Personnel

Regular Cashiers 1225

1240 Express Cashiers

1245 Fast Track Cashiers

	Time Interval	Regular Cashiers	
<input checked="" type="checkbox"/>	12:01 AM - 12:30 AM	0	1215
<input type="checkbox"/>	12:31 AM - 1:00 AM	0	
<input type="checkbox"/>	1:01 AM - 1:30 AM	0	
<input type="checkbox"/>	1:31 AM - 2:00 AM	0	
<input type="checkbox"/>	2:01 AM - 2:30 AM	0	
<input type="checkbox"/>	2:31 AM - 3:00 AM	0	
<input type="checkbox"/>	3:01 AM - 3:30 AM	0	
<input type="checkbox"/>	3:31 AM - 4:00 AM	0	
<input type="checkbox"/>	4:01 AM - 4:30 AM	0	
<input type="checkbox"/>	4:31 AM - 5:00 AM	0	
<input type="checkbox"/>	5:01 AM - 5:30 AM	0	
<input type="checkbox"/>	5:31 AM - 6:00 AM	0	
<input type="checkbox"/>	6:01 AM - 6:30 AM	2	
<input type="checkbox"/>	6:31 AM - 7:00 AM	2	
<input type="checkbox"/>	7:01 AM - 7:30 AM	3	
<input type="checkbox"/>	7:31 AM - 8:00 AM	3	
<input type="checkbox"/>	8:01 AM - 8:30 AM	3	

Print Schedules 1260

Return to Edit Form 1265

FIG. 12

Delete Parameter File

Model Name

Front End Model 1 (Store Checkout)

Scenario Name

Default

Delete and Return 1360

Return Without Deleting 1365

FIG. 13

Scalar Input Values

Input Parameters For Front End Model 1(Store Checkout)
February 24, 1999

Scenario Name: Default

Scenario Description: Default Case For FEM

Parameter	Value	Range	Description
Start time of the simulation scenario (hours)	6	0 to 24 (hours)	Start time of the simulation scenario in hour from midnight. Start time must be less than E time.
End time of the simulation scenario (hours)	23	0 to 24 (hours)	End time of the simulation scenario in hours from midnight. End time must be greater than Start time.
Number of Fast-Track lanes	1	0 to 47	Number of Fast-Track lanes at the front-end. The total number of all lanes (Fast-Track+Express+Regular) cannot exceed 48.
Number of Express lanes	3	0 to 47	Number of Express lanes at the front-end. The total number of all lanes (Fast-Track+Express+Regular) cannot exceed 48.
Number of Regular lanes	13	1 to 48	Number of Regular lanes at the front-end. Must be at least 1 Regular lane. The total number of all lanes (Fast-Track+Express+Regular) cannot exceed 48.

FIG. 14

Run Simulation Module

Models

Model Name	Value
Front End Model 1 (Store Checkout)	1512
Lane Model 1 (Front Facing)	1514
Lane Model 2 (Nelson)	1516
Lane Model 3 (Fast Track)	1518

Scenarios

Scenario Name	Scenario Description
Default	Default Case for FEM Model 1
Test 1	Add 4 Checkstands: 1 Express & 3 Regular

Return to Main Menu

Print Scenario

Run Simulation

Animation

FIG. 15

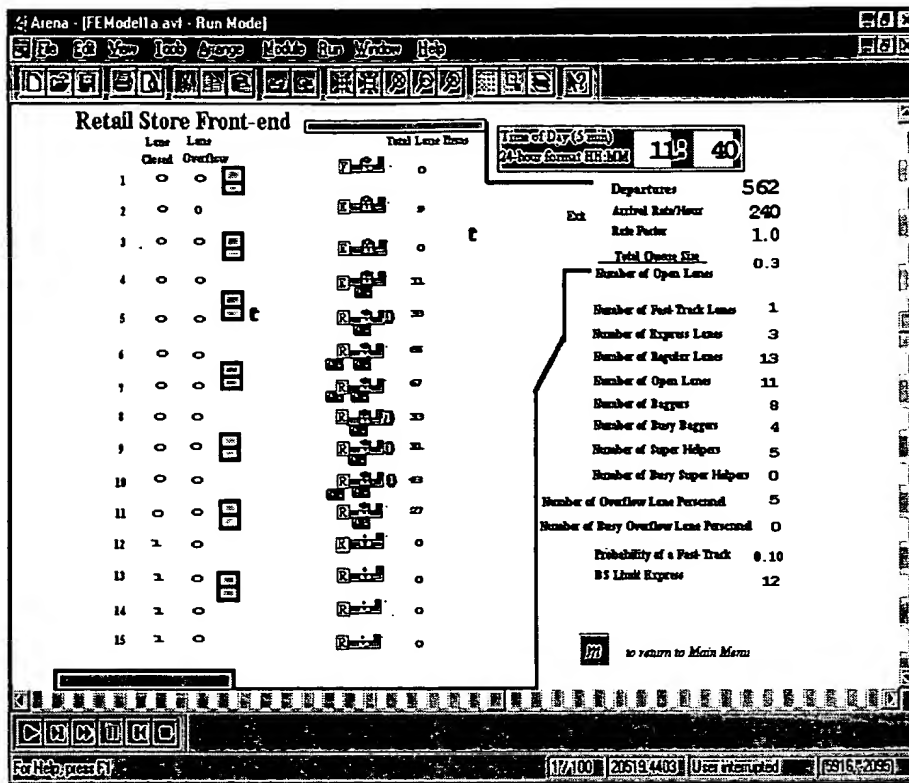


FIG. 16

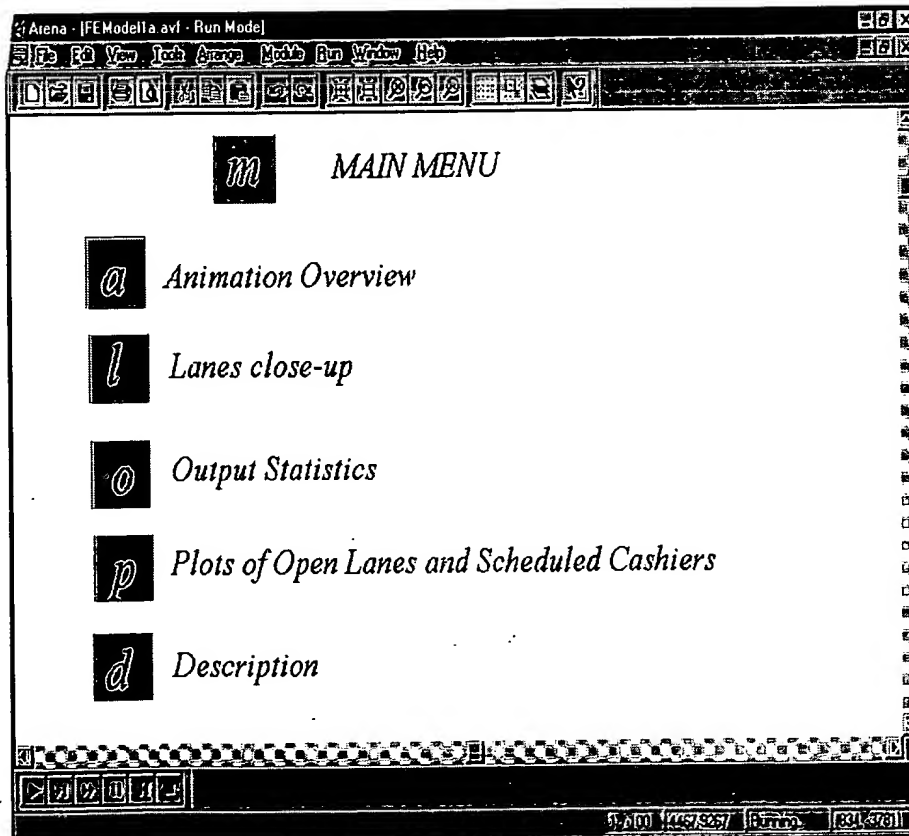


FIG. 17

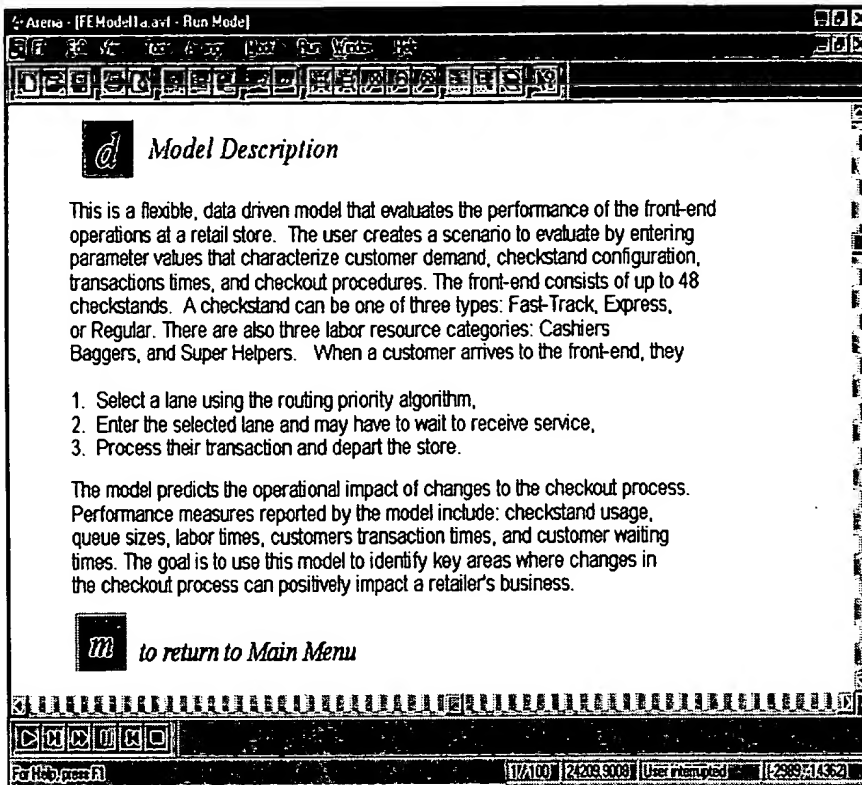


FIG. 20



FIG. 21

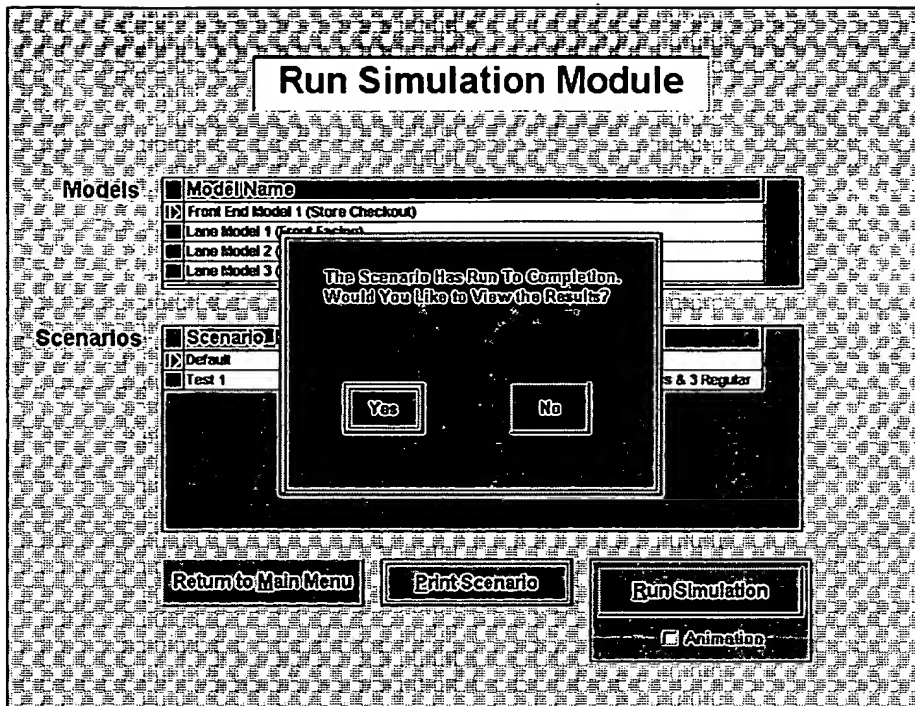


FIG. 22

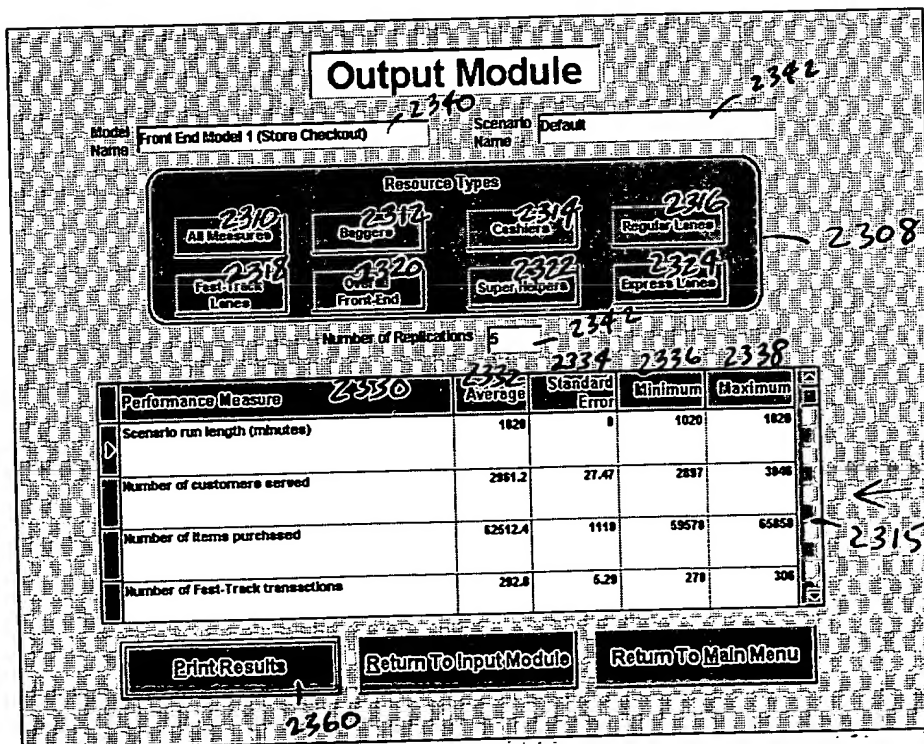


FIG. 23

Output Module

Model Name: Lane Model 2 (Nelson) Scenario Name: Default

Resource Types: All Model 10 Customer 2414 Counter 2416 Lane 2418 Server

Number of Replications: 50

Lane #	Performance Measure	Average	Standard Error	Minimum	Maximum
1	Scenario run length (minutes)	60	0	60	60
2	Total number of transactions lane 1	19.06	0.45	11	26
2	Total number of transactions lane 2	16.89	0.45	11	24
All	Total number of transactions both lanes	37.94	0.63	22	68

Print Results Return To Input Module Return To Main Menu

FIG. 24

Performance Measures

Performance Statistics For Front End Model 1 (Store Checkout)

March 2, 1999

Scenario Name: Default

Scenario Description: Default Case for FEModel 1

Performance Measure	Average	Standard Error	Minimum	Maximum
Scenario run length (minutes)	1,020.00	0.00	1,020.00	1,020.00
Number of customers served	2,956.30	9.94	2,818.00	3,046.00
Number of items purchased	62,134.40	268.63	59,115.00	65,109.00
Number of Fast-Track transactions	267.97	2.75	254.00	315.00
Number of Express transactions	1,036.60	5.78	967.00	1,091.00
Number of Regular transactions	1,631.73	5.56	1,575.00	1,690.00
Number of transactions with basket size less than or equal to Express limit	1,359.13	7.35	1,260.00	1,438.00
Fast-Track basket size	21.13	0.24	18.65	23.50
Express basket size	5.42	0.02	5.15	5.73
Regular basket size	30.91	0.11	29.40	31.76
Number of Fast-Track items checked	746.80	22.65	417.00	1,009.00
Number of Fast-Track 30% audits	28.23	0.98	18.00	40.00

FIG. 25

Performance Measures					
Performance Measures For Lane Model 2 (Nelson)					
March 2, 1999					
Scenario Name: Default					
Scenario Description: Default Case for LaneM2					
Performance Measure	Average	Standard Error	Minimum	Maximum	Lane #
Scenario run length (minutes)	80.00	0.00	80.00	80.00	0
Total number of transactions lane 1	10.08	0.45	11.00	26.00	1
Total number of transactions lane 2	10.88	0.45	11.00	24.00	2
Total number of transactions both lanes	37.94	0.88	22.00	50.00	0
Total number of items lane 1	280.10	11.84	112.00	445.00	1
Total number of items lane 2	267.88	10.15	123.00	421.00	2
Total number of items both lanes	647.98	18.92	258.00	858.00	0
Queue size lane 1	0.88	0.14	0.00	5.71	1
Queue size lane 2	0.82	0.11	0.00	3.71	2
Queue size both lanes	1.69	0.24	0.16	9.35	0

716.26

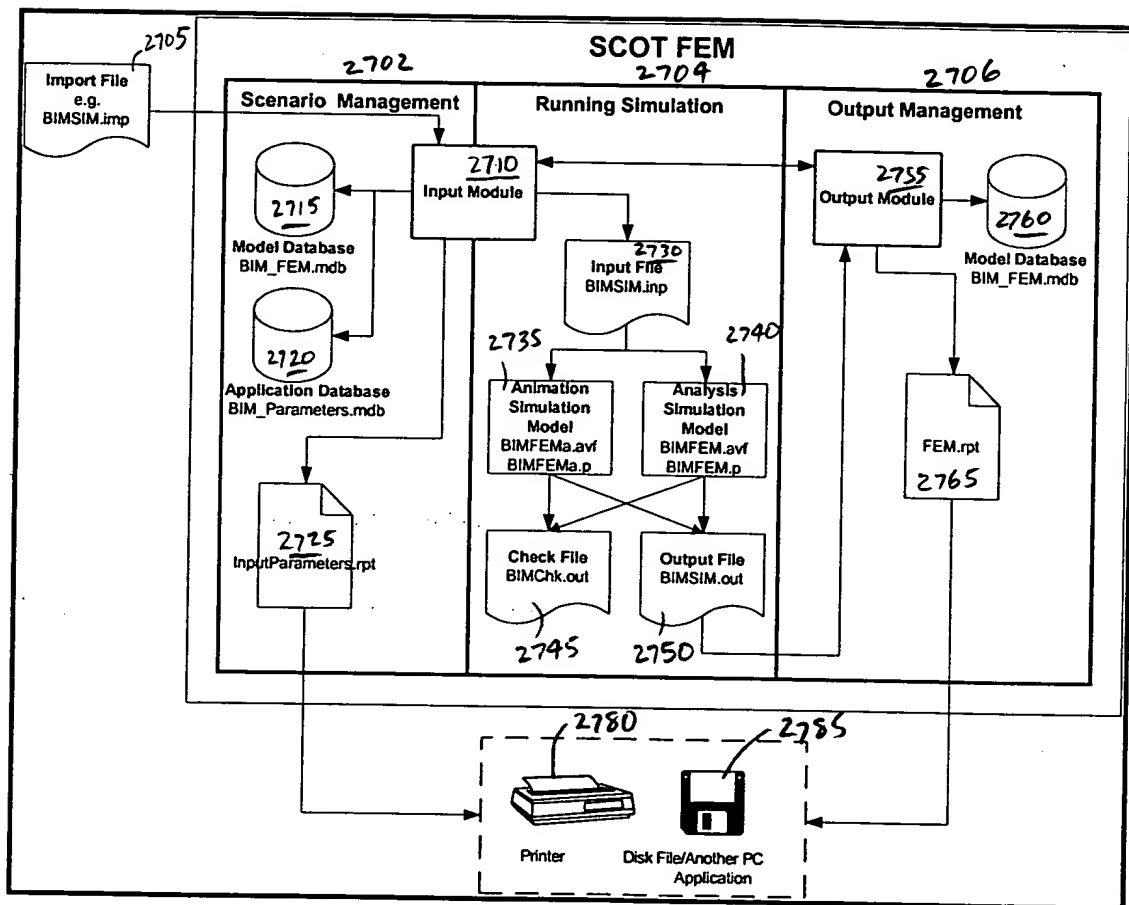


FIG. 27 SCOTFEM Process Flow Diagram

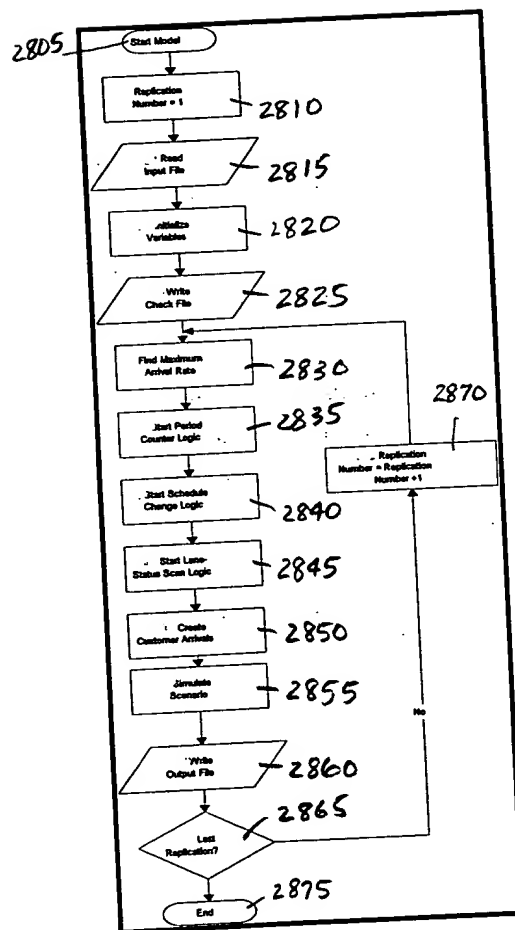


FIG. 28 Simulation Process

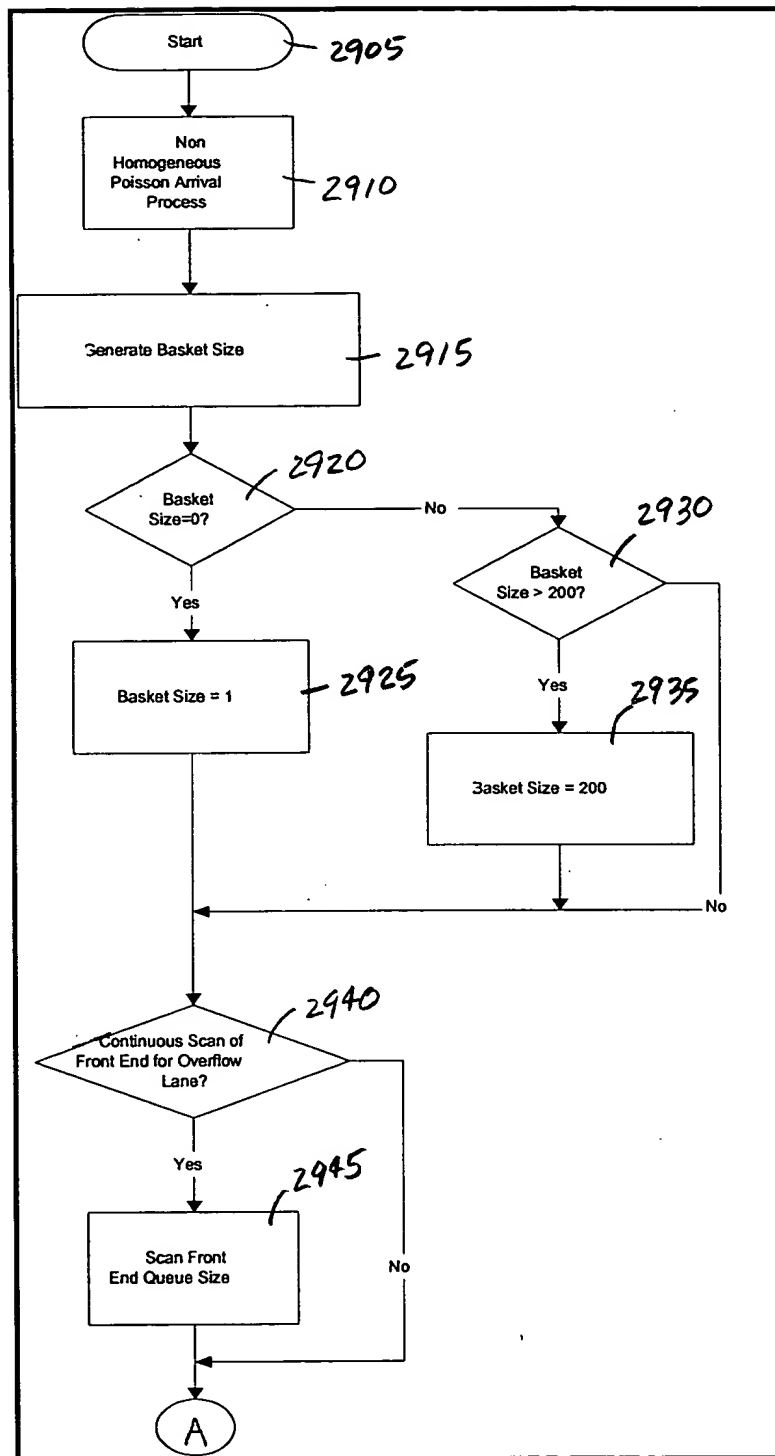


FIG 29 Customer Flow Process

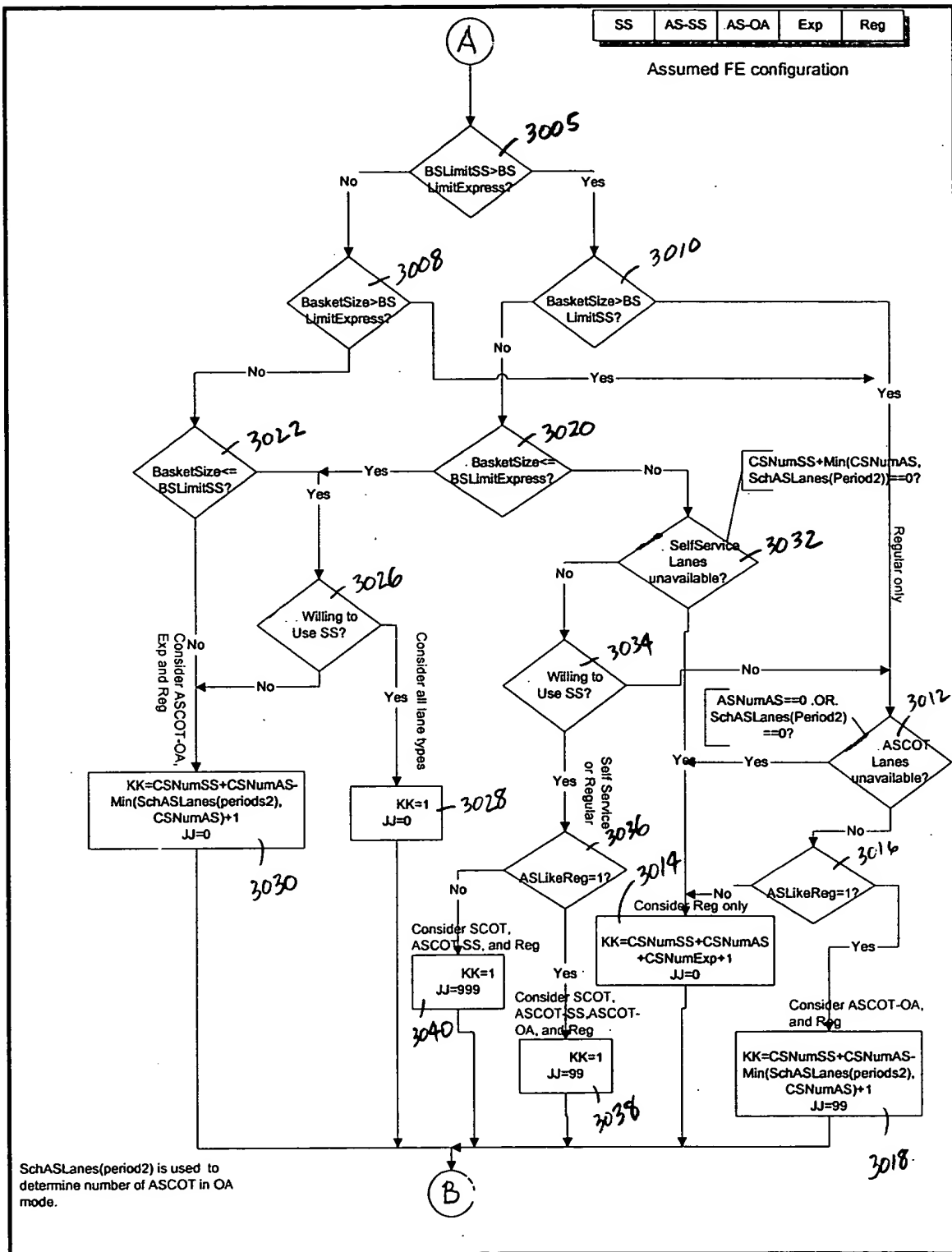


FIG 30 Choose Lane Logic

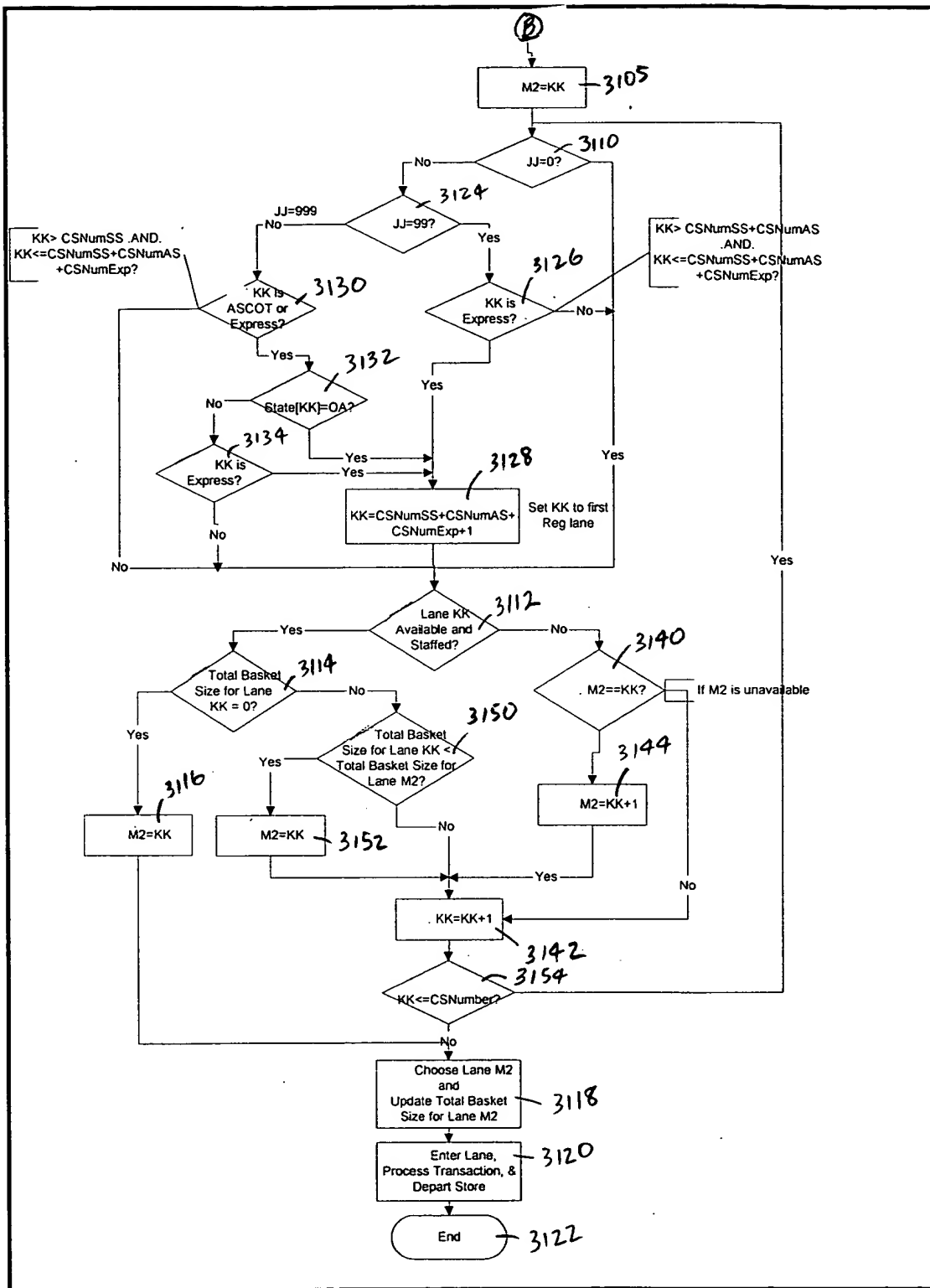


FIG 31 Choose Lane Logic - Continued

```

graph TD
    Start(( )) --> Customer
    subgraph Customer_Lane [Customer]
        Wait[Wait in line until cashier is available] --> Preitemize[Preitemize]
        Preitemize --> Bag1[Bag]
        Bag1 --> Tender[Tender]
        Tender --> Bag2[Bag]
    end
    subgraph Bagger_Lane [Bagger]
        Bag1
    end
    subgraph Cashier_Lane [Cashier]
        Itemize[Itemize] --> Misc[Miscellaneous]
        Misc --> Error[Error Correct]
        Error --> Tender2[Tender]
        Tender2 --> Bag3[Bag]
    end
    subgraph Supervisor_Lane [Supervisor]
        Intervention[Intervention]
        Bag4[Bag]
    end
    Bag1 -.-> Return([Return])
    Tender2 -.-> Return
    Bag3 -.-> Return
    Bag4 -.-> Return
    Return --> End(( ))
  
```

FIG 32

